Amendments to the Claims:

The following listing of claims replaces all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method of generating plasma in a toroidal plasma generator, said toroidal plasma generator comprising a gas passage having a gas entrance and a gas outlet, said gas passage forming a circuitous path, and a coil wound around a part of the gas passage,

wherein said method comprises the steps of supplying a mixed gas of an Ar gas and an NF_3 gas containing at least 5% of said NF_3 gas in terms of flow rate, igniting plasma by driving said coil with a high-frequency power, and increasing, after said step of igniting plasma, a total pressure of said mixed gas while maintaining said plasma,

said step of igniting plasma being conducted under a total pressure of 6.65-66.5Pa,

said method further comprising, after said step of increasing the total pressure of said mixed gas, ~~including~~ the step of switching a mass flow controller used to supply said NF_3 gas from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

2. (Previously Presented) The method of generating plasma as claimed in claim 1, wherein said mixed gas contains NF_3 by a concentration of 5% or more but not exceeding 45% in terms of flow rate in said plasma ignition step.

3. (Previously Presented) The method of generating plasma as claimed in claim 1, wherein said mixed gas in said plasma ignition step contains

NF_3 with a concentration of 10% or more but not exceeding 45% in terms of flow rate in said plasma ignition step.

4. (Previously Presented) The method of generating plasma as claimed in claim 1, wherein said mixed gas contains NF_3 with a concentration of 20% or more but not exceeding 45% in terms of flow rate in said plasma ignition step.

5. (Canceled)

6. (Previously Presented) The method of generating plasma as claimed in claim 1, wherein said step of increasing said total pressure of said mixed gas is conducted while maintaining a constant concentration of NF_3 in said mixed gas.

7. (Previously Presented) The method of generating plasma as claimed in claim 1, wherein said step of increasing the total pressure of said mixed gas is conducted while changing a concentration of NF_3 in said mixed gas.

8. (Previously Presented) The method of generating plasma as claimed in claim 1, wherein said mixed gas contains NF_3, after said step of increasing said total pressure of said mixed gas, with a concentration of 5 – 40% in terms of flow rate.

9. (Previously Presented) The method of generating plasma as claimed in claim 1, wherein said mixed gas is supplied with a flow rate of 100SCCM or less in said plasma ignition step.

10. (Previously Presented) The method of generating plasma as claimed in claim 1, wherein said mixed gas is supplied with a flow rate of 3SCCM or more but not exceeding 80SCCM.

11. (Currently Amended) A method of generating plasma in a toroidal plasma generator, said toroidal plasma generator comprising a gas passage having a gas entrance and a gas outlet, said gas passage forming a circuitous path, and a coil wound around a part of said gas passage,

wherein said method comprises the steps of supplying a mixed gas of an Ar gas and a F_2 gas containing at least 5% of said F_2 gas in terms of flow rate, igniting plasma by driving said coil with a high-frequency power, and increasing, after said ignition step, a total pressure of said mixed gas while maintaining said plasma,

said step of igniting plasma being conducted under a total pressure of 6.65-66.5Pa,

said method further comprising, after said step of increasing said total pressure of said mixed gas, ~~including~~ the step of switching a mass flow controller used to supply said F_2 gas from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

12. (Previously Presented) The method of generating plasma as claimed in claim 11, wherein said mixed gas contains F_2 with a concentration of 5% or more but not exceeding 45% in terms of flow rate.

13. (Canceled)

14. (Previously Presented) The method of generating plasma as claimed in claim 11, wherein said step of increasing said total pressure of said mixed gas is conducted while maintaining a constant concentration of F_2 in said mixed gas.

15. (Previously Presented) The method of generating plasma as claimed in claim 11, wherein said step of increasing said total pressure of said mixed gas is conducted while changing a concentration of F_2 in said mixed gas.

16. (Previously Presented) The method of generating plasma as claimed in claim 11, wherein said mixed gas is supplied with a flow rate of 100SCCM or less in said plasma ignition step.

17. (Currently Amended) A cleaning method for cleaning a processing vessel evacuated by an evacuating system and coupled with a remote plasma source,

said remote plasma source comprising a toroidal plasma generator, said toroidal plasma generator comprising a gas passage having a gas entrance and a gas outlet, said gas passage forming a circuitous path, and a coil wound around a part of said gas passage,

wherein said cleaning method comprises the steps of:

forming radicals containing F in said remote plasma source; and

supplying said radicals to an interior of said processing vessel and cleaning said interior of said processing vessel by said radicals,

said step of forming said radicals comprising the steps of:

supplying a mixed gas containing at least 5% of a fluorine-containing species of NF_3 or F_2 in terms of flow rate in an Ar gas to said gas passage as a cleaning gas with a first pressure in which plasma can ignite and igniting plasma by driving said coil by a high-frequency power; and

increasing, after ignition of said plasma, a total pressure of said mixed gas in said gas passage to a second pressure while maintaining said plasma,

said cleaning step cleaning said interior of said processing vessel at said second pressure,

said method further comprising, after said step of increasing said total pressure of said mixed gas, ~~including~~ the step of switching a mass flow

controller used to supply a gas of said fluorine-containing species from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

18. (Previously Presented) The cleaning method as claimed in claim 17, wherein said step of increasing said total pressure of said mixed gas comprises a step of changing a conductance of said evacuation system and a step of changing a flow rate of said mixed gas.

19. (Previously Presented) The cleaning method as claimed in claim 17, wherein said step of changing said total pressure of said mixed gas is conducted by changing a conductance of said evacuation system and a flow rate of said mixed gas simultaneously.

20. (Previously Presented) The cleaning method as claimed in claim 17, wherein said step of changing said total pressure of said mixed gas comprises a step of decreasing a conductance of said evacuation system while maintaining a flow rate of said mixed gas constant, and a step of increasing said flow rate of said mixed gas while maintaining said total pressure constant.

21. (Previously Presented) The cleaning method as claimed in claim 20, wherein said method further comprises a step of increasing said flow rate of said mixed gas while holding said conductance of said evacuation system maximum.

22. (Canceled)

23. (Previously Presented) The cleaning method as claimed in claim 17, wherein said step of increasing said total pressure of said mixed gas is

conducted while maintaining said concentration of said cleaning gas in said mixed gas constant.

24. (Previously Presented) The cleaning method as claimed in claim 17, wherein said step of increasing said total pressure of said mixed gas is conducted while changing said concentration of said cleaning gas in said mixed gas.

25. (Previously Presented) The cleaning method as claimed in claim 17, wherein said cleaning step is conducted by setting said concentration of NF_3 in said mixed gas to 50-40% in terms of flow rate.

26. (Previously Presented) The cleaning method as claimed in claim 17, wherein said mixed gas is supplied with a flow rate of 100SCCM or less in said plasma ignition step.

27. (Previously Presented) The cleaning method as claimed in claim 17, wherein said mixed gas contains NF_3 as said cleaning gas and wherein said first pressure is set to 6.65-66.5Pa.

28. (Previously Presented) The cleaning method as claimed in claim 27, wherein said mixed gas contains NF_3, in said plasma ignition step, as said cleaning gas with a concentration of 5% or more but not exceeding 45% in terms of flow rate.

29. (Previously Presented) The cleaning method as claimed in claim 27, wherein said mixed gas contains NF_3, in said plasma ignition step, as said cleaning gas with a concentration of 10% or more but not exceeding 45% in terms of flow rate.

30. (Previously Presented) The cleaning method as claimed in claim m 27, wherein said mixed gas contains NF_3, in said plasma ignition step, with a concentration of 20% or more but note exceeding 45% in terms of flow rate.

31. (Previously Presented) The cleaning method as claimed in claim 17, wherein said mixed gas contains F2 as said cleaning gas, and wherein said first pressure is set to 6.65 - 66.5Pa.

32. (Previously Presented) The cleaning method as claimed in claim 31, wherein said mixed gas contains F_2, in said plasma ignition step, as said cleaning gas with a concentration of 5% or more but not exceeding 45% in terms of flow rate.

33. (Currently Amended) A substrate processing method in a processing vessel evacuated by an evacuation system and coupled with a remote plasma source,

wherein said remote plasma source comprises a toroidal plasma generator comprising a gas passage having a gas entrance and a gas outlet and forming a circuitous path, and a coil wound around a part of said gas passage,

said substrate processing method comprising the steps of:

forming radicals containing F in said remote plasma source; and

etching a surface of a substrate to be processed in said processing vessel by said radicals by supplying said radicals to an interior of said processing vessel,

said step of forming said radicals comprising the steps of:

supplying a mixed gas containing a fluorine-containing species of NF_3 or F_2 in an Ar gas with a concentration of at least 5% in terms of flow rate to said gas passage under a first pressure in which ignition of plasma is possible and igniting plasma by driving said coil with a high-frequency power; and

increasing, after ignition of said plasma, a total pressure of said mixed gas in said passage to a second pressure while maintaining said plasma,

said step of etching being conducted under said second pressure,

said method further comprising, after said step of increasing said total pressure of said mixed gas, ~~including~~ the step of switching a mass flow controller used to supply a gas of said fluorine-containing species from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

34. (Previously Presented) The substrate processing method as claimed in claim 33, wherein said step of increasing said total pressure of said mixed gas comprises a step of changing a conductance of said evacuation system and a step of changing a flow
rate of said mixed gas.

35. (Original) The substrate processing method as claimed in claim 33, wherein said step of changing said total pressure of said mixed gas is conducted by changing a conductance of said evacuating system and a flow rate of said mixed gas simultaneously.

36. (Previously Presented) The substrate processing method as claimed in claim 33, wherein said step of changing said total pressure of said mixed gas comprises a step of decreasing a conductance of said evacuation system while maintaining a flow rate of said mixed gas constant, and a step of increasing said flow rate of said mixed gas while maintaining said total pressure constant.

37. (Previously Presented) The substrate processing method as claimed in claim 36, wherein said method further comprises a step of increasing said flow rate of said mixed gas while holding said conductance of said evacuation system maximum.

38. (Previously Presented) The substrate processing method as claimed in claim 33, wherein said step of changing said total pressure of said mixed gas comprises the step of switching plural mass flow controllers.

39. (Previously Presented) The substrate processing method as claimed in claim 33, wherein said step of increasing said total pressure of said mixed gas is conducted while maintaining said concentration of said etching gas in said mixed gas constant.

40. (Previously Presented) The substrate processing method as claimed in claim 33, wherein said step of increasing said total pressure of said mixed gas is conducted while changing said concentration of said etching gas in said mixed gas.

41. (Previously Presented) The substrate processing method as claimed in claim 33, wherein said etching step is conducted by setting said concentration of NF_3 in said mixed gas to 50-40% in terms of flow rate.

42. (Previously Presented) The substrate processing method as claimed in claim 33, wherein said mixed gas is supplied in said plasma ignition step with a flow rate of 100SCCM or less.

43. (Previously Presented) The substrate processing method as claimed in claim 33, wherein said mixed gas contains NF_3 as said etching gas, and wherein said first pressure is set to 6.65 - 66.5Pa.

44. (Previously Presented) The substrate processing method as claimed in claim 43, wherein said mixed gas contains NF_3 in said plasma ignition step as said etching gas with a concentration of 5% or more but not exceeding 45% in terms of flow rate.

45. (Previously Presented) The substrate processing method as claimed in claim 43, wherein said mixed gas contains NF_3 as said etching gas in said plasma ignition step with a concentration of 10% or more but not exceeding 45% in terms of flow rate.

46. (Previously Presented) The substrate processing method as claimed in claim 43, wherein said mixed gas contains NF_3 as said etching gas in said plasma ignition step with a concentration of 20% or more but not exceeding 45% in terms of flow rate.

47. (Previously Presented) The substrate processing method as claimed in claim 33, wherein said mixed gas contains F_2 as said etching gas and wherein said first pressure is set to 6.65 - 66.5Pa.

48. (Previously Presented) The substrate processing method as claimed in claim 47, wherein said mixed gas contains F_2 as said etching gas in said plasma ignition step with a concentration of 5% or more but not exceeding 45% in terms of flow rate.

49. (Currently Amended) A cleaning method for cleaning an interior of a processing vessel by plasma-excited radicals of a cleaning gas under a first pressure zone, said method comprising the steps of:

introducing a mixed gas of a diluting gas and a cleaning gas to a plasma generator under a second pressure lower than said first pressure and igniting plasma; and

increasing, after ignition of said plasma, a pressure inside said processing vessel to said first pressure zone from said second pressure zone while maintaining said plasma,

said method further comprising, after said step of increasing said total pressure of said mixed gas, ~~including~~ the step of switching a mass flow controller used to supply said cleaning gas from a first mass flow controller having

a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

50. (Previously Presented) The cleaning method as claimed in claim 49, wherein said cleaning gas contains a halogen compound.

51. (Previously Presented) The cleaning method as claimed in claim 49, wherein said cleaning gas contains NF_3.

52. (Previously Presented) The cleaning method as claimed in claim 49, wherein said cleaning gas contains F_2.

53. (Previously Presented) The cleaning method as claimed in claim 49, wherein said diluting gas is selected from the group consisting of Ar, Kr and Xe.

54. (Previously Presented) The cleaning method as claimed in claim 49, wherein said plasma generator is a toroidal plasma generator.

55. (Previously Presented) The cleaning method as claimed in claim 49, wherein said plasma generator is selected from the group consisting of a capacitive-coupled plasma generator, an induction-coupled plasma generator, an ECR plasma generator, a helicon wave plasma generator, and a microwave cavity plasma generator.

56. (Currently Amended) A substrate processing method for etching a surface of a substrate to be processed by plasma-excited radicals under a first pressure zone, comprising the steps of:

introducing a mixed gas of a diluting gas and an etching gas into a plasma generator under a pressure of a second pressure zone lower than said first pressure and igniting plasma; and

increasing, after ignition of said plasma, a pressure inside said processing vessel to said first pressure zone from said second pressure zone while maintaining said plasma,

said method further comprising, after said step of increasing said pressure inside said processing vessel, ~~including~~ the step of switching a mass flow controller used to supply said etching gas from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

57. (Previously Presented) The substrate processing method as claimed in claim 56, wherein said etching gas contains a halogen compound.

58. (Previously Presented) The substrate processing method as claimed in claim 56, wherein said etching gas contains NF_3.

59. (Previously Presented) The substrate processing method as claimed in claim 56, wherein said etching gas contains F_2.

60. (Previously Presented) The substrate processing method as claimed in claim 56, wherein said diluting gas is selected from the group consisting of Ar, Kr and Xe.

61. (Previously Presented) The substrate processing method as claimed in claim 56, wherein said plasma generator is a toroidal type plasma generator.

62. (Previously Presented) The substrate processing method as claimed in claim 56, wherein said plasma generator is selected from the group consisting of a capacitive-coupled plasma generator, an induction-coupled plasma generator, an ECR plasma generator, a helicon wave plasma generator, and a microwave cavity plasma generator.

63. (Currently Amended) A cleaning method for cleaning an interior of a processing vessel by plasma-excited radicals of a cleaning gas with a first flow rate zone, comprising the steps of:

introducing a mixed gas of a diluting gas and a cleaning gas into a plasma generator under a flow rate of a second flow rate zone smaller than said first flow rate zone and igniting plasma; and

increasing, after ignition of said plasma, a flow rate of said mixed gas from said first flow rate zone to said second flow rate zone while maintaining said plasma,

said method further comprising, after said step of increasing said pressure inside said processing vessel, ~~including~~ the step of switching a mass flow controller used to supply said etching gas from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

64. (Previously Presented) The cleaning method as claimed in claim 63, wherein said cleaning gas contains a halogen compound.

65. (Previously Presented) The cleaning method as claimed in claim 63, wherein said cleaning gas contains NF_3.

66. (Previously Presented) The cleaning method as claimed in claim 63, wherein said cleaning gas contains F_2.

67. (Previously Presented) The cleaning method as claimed in claim 63, wherein said diluting gas is selected from the group consisting of Ar, Kr and Xe.

68. (Previously Presented) The cleaning method as claimed in claim 63, wherein said plasma generator is a toroidal plasma generator.

69. (Previously Presented) The cleaning method as claimed in claim 63, wherein said plasma generator is selected from the group consisting of a capacitive-coupled plasma generator, an induction-coupled plasma generator, an ECR plasma generator, a helicon wave plasma generator, and a microwave cavity plasma generator.

70. (Previously Presented) A substrate processing method for etching a surface of a substrate to be processed in a processing vessel by plasma-excited radicals of etching under a first flow rate zone, comprising the steps of:

introducing a mixed gas of a diluting gas and an etching gas into a plasma generator under a second flow rate zone smaller than said first flow rate zone and igniting plasma; and

increasing, after ignition of said plasma, a flow rate of said mixed gas from said second flow rate zone to said first flow rate zone.

71. (Previously Presented) The substrate processing method as claimed in claim 70, wherein said cleaning gas contains a halogen compound.

72. (Previously Presented) The substrate processing method as claimed in claim 70, wherein said cleaning gas contains NF_3.

73. (Previously Presented) The substrate processing method as claimed in claim 70, wherein said cleaning gas contains F_2.

74. (Previously Presented) The substrate processing method as claimed in claim 70, wherein said diluting gas is selected from the group consisting of Ar, Kr and Xe.

75. (Previously Presented) The substrate processing method as claimed in claim 70, wherein said plasma generator is a toroidal plasma generator.

76. (Previously Presented) The substrate processing method as claimed in claim 70, wherein said plasma generator is selected from the group consisting of a capacitive-coupled plasma generator, an induction-coupled plasma generator, an ECR plasma generator, a helicon wave plasma generator, and a microwave cavity plasma generator.

77. (Currently Amended) A method of generating plasma in a toroidal plasma generator, said toroidal plasma generator comprising a gas passage having a gas entrance and a gas outlet, said gas passage forming a circuitous path, and a coil would around a part of the gas passage,

wherein said method comprises the steps of supplying a mixed gas of an Ar gas and an NF_3 gas containing at least 5% of said NF_3 gas in terms of flow rate, igniting plasma by driving said coil with a high-frequency power, and increasing, after said step of igniting plasma, a concentration of said NF_3 gas in said mixed gas <u>while maintaining said plasma</u>,

said step of igniting plasma being conducted under a total pressure of 6.65-66.5Pa,

<u>said method further comprising, after</u> said step of increasing the total pressure of said mixed gas, ~~including~~ the step of switching a mass flow controller used to supply said NF_3 gas from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

78. (Currently Amended) A method of generating plasma in a toroidal plasma generator, said toroidal plasma generator comprising a gas passage having a gas entrance and a gas outlet, said gas passage forming a circuitous path, and a coil would around a part of the gas passage,

wherein said method comprises the steps of supplying a mixed gas of an Ar gas and an F_2 gas containing at least 5% of said F_2 gas in terms of flow rate, igniting plasma by driving said coil with a high-frequency power, and increasing, after said ignition step, a concentration of said F_2 gas in said mixed gas while maintaining said plasma,

said step of igniting plasma being conducted under a total pressure of 6.65-66.5Pa,

said method further comprising, after said step of increasing the total pressure of said mixed gas, ~~including~~ the step of switching a mass flow controller used to supply said F_2 gas from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

79. (Currently Amended) A cleaning method for cleaning a processing vessel evacuated by an evacuating system and coupled with a remote plasma source,

said remote plasma source comprising a toroidal plasma generator, said toroidal plasma generator comprising a gas passage having a gas entrance and a gas outlet, said gas passage forming a circuitous path, and a coil wound around a part of said gas passage,

wherein said cleaning method comprises the steps of:

forming radicals containing F in said remote plasma source; and

supplying said radicals to an interior of said processing vessel and cleaning said interior of said processing vessel by said radicals,

said step of forming said radicals comprising the steps of:

supplying a mixed gas containing at least 5% of a fluorine-containing species of NF_3 or F_2 in terms of flow rate in an Ar gas to said gas passage as a cleaning gas with a first pressure in which plasma can ignite and igniting plasma by driving said coil by a high-frequency power; and

increasing, after ignition of said plasma, a concentration of NF_3 or F_2 in said mixed gas in said gas passage to a second pressure while maintaining said plasma,

said cleaning step cleaning said interior of said processing vessel at said second pressure,

said method further comprising, after said step of increasing said total pressure of said mixed gas, ~~including~~ the step of switching a mass flow controller used to supply a gas of said fluorine-containing species from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

80. (Currently Amended) A substrate processing method in a processing vessel evacuated by an evacuation system and coupled with a remote plasma source,

wherein said remote plasma source comprises a toroidal plasma generator comprising a gas passage having a gas entrance and a gas outlet and forming a circuitous path, and a coil wound around a part of said gas passage

said substrate processing method comprising the steps of:

forming radicals containing F in said remote plasma source; and

etching a surface of a substrate to be processed in said processing vessel by said radicals by supplying said radicals to an interior of said processing vessel,

said step of forming said radicals comprising the steps of:

supplying a mixed gas containing a fluorine-containing species of NF_3 or F_2 in an Ar gas with a concentration of at least 5% in terms of flow rate to

said gas passage under a first pressure in which ignition of plasma is possible and igniting plasma by driving said coil with a high-frequency power; and

increasing, after ignition of said plasma, a concentration of a fluorine-containing species of NF_3 or F_2 in said mixed gas in said passage to a second pressure while maintaining said plasma,

said step of etching being conducted under said second pressure,

said method further comprising, after said step of increasing said concentration of said fluorine-containing species, ~~includes~~ the step of switching a mass flow controller used to supply a gas of said fluorine-containing species from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

81. (Currently Amended) A cleaning method for cleaning an interior of a processing vessel by plasma-excited radicals of a cleaning gas of a first concentration, said method comprising the steps of:

introducing a mixed gas of a diluting gas and said cleaning gas to a plasma generator with a second concentration lower than said first concentration and igniting plasma; and

increasing, after ignition of said plasma, a concentration of said cleaning gas in said processing vessel to said first concentration from said second concentration while maintaining said plasma,

said method further comprising, after said step of increasing said concentration of said cleaning gas, ~~includes~~ the step of switching a mass flow controller used to supply said cleaning gas from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.

82. (Currently Amended) A substrate processing method for etching a surface of a substrate to be processed by plasma-excited radicals of an etching gas of a first concentration, comprising the steps of:

introducing a mixed gas of a diluting gas and said etching gas into a plasma generator with a second concentration lower than said first concentration for said etching gas and igniting plasma; and

increasing, after ignition of said plasma, a concentration of said etching gas in said processing vessel to said first concentration from said second concentration while maintaining said plasma,

said method further comprising, after said step of increasing said concentration of said etching gas, ~~includes~~ the step of switching a mass flow controller used to supply said etching gas from a first mass flow controller having a first capacity to a second mass flow controller having a second capacity larger than said first capacity, said step of switching said mass flow controller being conducted while maintaining said plasma.